THE PART PLAYED BY BRITISH MEDICAL WOMEN IN THE WAR.

BY

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IN the days of peace medical women took their share in all phases of professional life in Great Britain and Ireland so that they needed no separate history. But in war the spheres of work open to them are limited by military considerations, and it has seemed proper, therefore, to attempt some account of the manner in which they have come forward to render professional services to the wounded and sick. They have not shrunk from personal risk and hardship, and at the same time have done their part in bringing modern scientific methods to bear on the novel clinical problems with which the special circumstances of this war have confronted military medicine, and have not only individually shown untiring energy in emergencies, but also an admirable capacity of a combination and organization in face of unforeseen difficulties. The account does not profess to be complete, it does not make mention of much good work done by individuals, and contains little reference to the many medical women who have laboured with medical men at home for the good of the civil population; but such as it is it has an interest of its own as a sketch of the work done by British medical women in the first war in which they have been numerous enough to count.

In the early days of the war British medical women volunteered their services in aid of the wounded of their own country, but finding that the British Red Cross and the War Office were at that time amply supplied, they turned their attention to the needs of the Allies, whose countries were already invaded by the enemy. Units composed partly or entirely of women were accepted for service under the Belgian, French, and Serbian Red Cross.

The Women's Imperial Service League was the first to send a hospital to Belgium, and though, owing to the rapid and unfortunate march of events there, its career was short, it rendered very material service during the siege of Antwerp. Miss Stoney, M.B., B.S.Lond., with a staff of six women doctors, was in charge of the hospital, which was full of seriously wounded cases when the bombardment on October 8th took place. The hospital was eighteen hours under shell fire before the patients (Belgians and some British) could be placed in comparative safety. During this time no member of the unit was injured, although the ground was littered with shell and the houses round were burning. The unit crossed the Scheldt by the bridge of boats on London motor buses to join the retreating British marines twenty minutes before the boats were blown up by the retreating Belgians.

In November, 1914, the unit was formed again, and a hospital of 70 beds was established at Cherbourg under the French Red Cross in an ancient chateau. Two days after their arrival seriously wounded French, Belgians, and Senegalese came in from Dunkirk by boat. Most of the cases had badly comminuted fractures, and, as they did not arrive until four to eight days after being wounded, a considerable number of amputations had to be performed for gangrene, advanced sepsis, septicaemia, and secondary haemorrhage.

It was not until the spring of 1915 that medical women undertook the full charge of British wounded in England, although in October, 1914, Dr. Louisa Garrett Anderson established, under the French Red Cross, a small hospital in Paris which received some British wounded.

In consequence of a rearrangement of the transport of the wounded the hospital at Cherbourg was closed early in 1915. Dr. Florence Stoney was appointed radiologist to the Fulham Military Hospital in April of that year, with a ward for the treatment of cases of disordered action of the heart, shell shock, and Graves's disease. By January, 1916, this department had already examined 4,351 cases, and had taken 5,530 skiagrams, in addition to giving x ray, high frequency treatment, and vibratory massage. The special study of the action of x rays in hyperthyroidism led Dr. Stoney to point out the close connexion between hyperactivity of the thyroid gland and the tachycardia and breathlessness seen in cases of "irritable heart" and "soldier's heart." By x-ray treatment the thyroid gland can be reduced in size. As it grows smaller the symptoms disappear. The thyroid in exophthalmic goitre is much more easily affected by x rays than the thyroid of a quiescent bronchocele, as the glandular cells are in a very active condition. Conditions similar to Graves's disease are produced by war strain. Dr. Stoney believes that x rays are a specific for exophthalmic goitre, though the heart condition is incurable, the muscle remaining weak, so that the organ can be more easily overstrained than a healthy heart. Symptoms of hyperthyroidism are often of late onset in ordinary bronchocele, when microscopically areas of altered tissue similar to that occurring in exophthalmic goitre are found. Thus Graves's disease may be primary (most of the cases in the war come under this group), or grafted on to a pre-existing bronchocele. Dr. Stoney places special stress on the following abnormal symptoms needing treatment: (1) Fine tremor, (2) excessive perspiration, (3) great nervousness and twitchings, and (4) a pulse-rate habitually over 90. A common combination is tremors, breathlessness, tachycardia, weakness, and sweating, nervous twitchings, and obliteration of wrinkles on the forehead. Though x-ray treatment does not deal with the primary cause of the disease it relieves the patient by lessening the thyroid gland. Its chief disadvantage is that several sittings, spread over a couple of months or more, are required. X rays are applied as vigorously as is compatible with safety. One Sabouraud dose filtered through one or two millimetres of aluminium is given to each side of the thyroid weekly in about twenty minutes. The heart is one of the earliest organs to respond, becoming regular and of normal size. After some time exophthalmos usually disappears and the goitre diminishes. The only risk is that of temporary pigmentation of the skin occasionally going on to telangiectasis.

Scottish Women's Hospitals.

In September, 1914, an Edinburgh graduate, Dr. Elsie Inglis, was instrumental in promoting the formation of the Scottish Women's Hospitals for foreign service, and units consisting entirely of women were arranged for Belgium, France, and Serbia. The first unit, intended for Belgium, was, owing to the German occcupation of that country, sent to Calais. It was not a complete unit, but consisted of a staff of doctors and ten nurses under Dr. Alice Hutchinson. It worked during the severe typhoid epidemic among the Belgian soldiers under Dr. Dépage from November, 1914, to April, 1915; the mortality among its patients was relatively low.

Work in France.

At the beginning of December, 1914, the first complete hospital unit was sent out under the French Red Cross, and was established in the Abbaye de Royaumont. Within easy distance of a large evacuating station the Abbaye, from its size and situation, proved to be an excellent site. Although within sound of the guns, its architectural beauty and the forest scenery in the neighbourhood made it an ideal spot in which the wounded soldier could forget for a time the horrors and discomfort of war. After inspection by the Service de Santé the hospital was opened on January 13th, 1915, as Hôpital Auxiliaire 301, fully equipped for the reception of surgical cases.

Dr. Agnes Savill has described the difficulties encountered in making the first x-ray installation. An x-ray room was fitted up close to the operating theatre and a developing room was contrived in a large cupboard with a fish-kettle as a cistern. In spite of this the developing was easily performed until there came a rush of work. Then a village plumber, who had known the abbey in the days of the nuns, found a cold water pipe in a cupboard on the first floor. This space was promptly fitted up as a developing-room, but experience of the first months proved that it was possible to turn out good work without all the luxuries and conveniences to which students trained in a medical school are accustomed.

In a short time a bacteriological laboratory was added, a theatre, and an elaborate *x*-ray installation were equipped, and the number of beds was increased to 400. The cloisters lent themselves very well for the open-air treatment of wounds, and the large halls on the ground floor made it possible to wheel the beds out so that a large proportion of the cases could spend part of the day out of doors.

The medical staff included a surgeon-in-charge, five assistant surgeons, an anaesthetist, and a bacteriologist; there were thirty trained nurses, and about forty women orderlies, usually untrained volunteers who worked in the wards as probationers, helped in the kitchen, looked after stores, carried stretchers, and assisted in all the departments under trained heads.

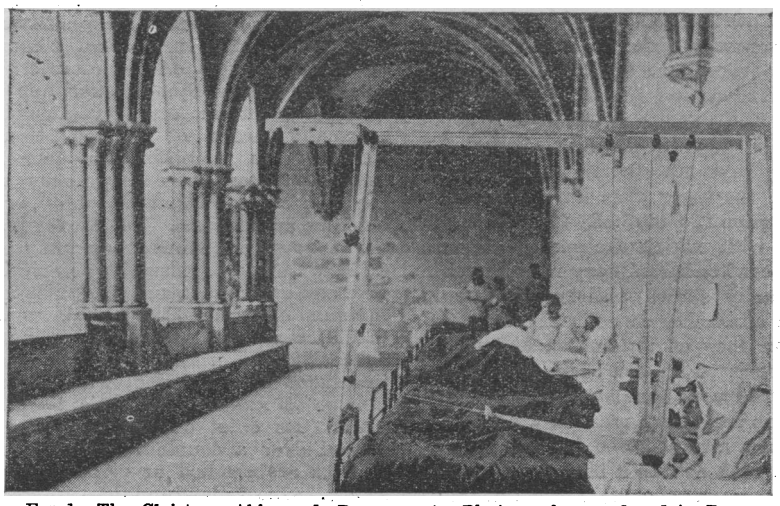

FIG. 1.—The Cloisters, Abbaye de Royaumont. Photograph reproduced in *Proc. Roy. Soc. Med.*, February, 1917.

The wounded are brought in from the military evacuating station by motor ambulances under the charge of women drivers. This is responsible work, for trains frequently arrive at night, the roads are by no means ideal, and during a rush the chauffeuses must work many hours without a break.

An *x*-ray car enables the radiologist to do radiographic work for those neighbouring hospitals which have no installation.

From the start the work of the Royaumont Hospital has been continuous, though in the early summer of 1916 the hospital was almost cleared in preparation for the attack on the Somme. The refectory was then arranged as a ward with 100 beds, and in a few hours, on July 2nd, was almost filled with seriously wounded cases.

In two years 2,527 patients had passed through the hospital and 2,859 operations had been performed, with a mortality of 48 (1.9 per cent.). Cases of almost every type of severity were admitted, but when an attack was proceeding they generally included a percentage of cases of gas gangrene. In December, 1916, Miss Ivens, M.S., Médecin Chef of the hospital, read a paper before the Surgical Section of the Royal Society of Medicine, in which she dealt with cases of anaërobic wound infections which had occurred in the hospital. She presented an analysis of 464 cases of gas infection, of which 107 were clinically gas gangrene. Attention was drawn to the importance of complete bacteriological study and the careful examination of the *x*-ray plates, which, in the majority of cases, showed the situation of gas bubbles or streaks according to the species of microbe present, thus affording extremely valuable aid in a decision as to the form of treatment required. The factors enumerated as of importance in the production of gas gangrene were:

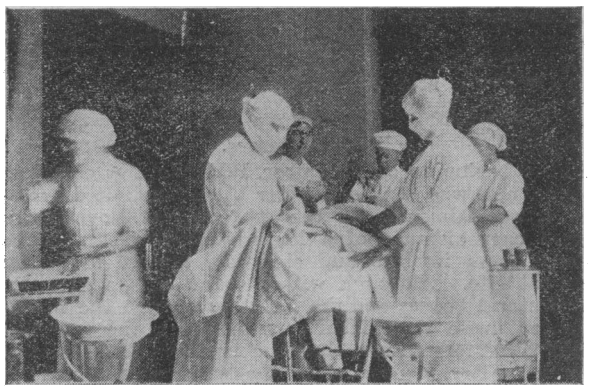

FIG. 2.—The Theatre.

1. The proximity to contaminated soil. Wounds of the lower limb showed a mortality three times as great as those of the upper, though wounds of the upper were more frequent.

2. Shell wounds were six times as frequent in gas gangrene as in ordinary infected wounds.

3. The presence of an infected wad of clothing kept up infection.

4. The interval between the wound and the first surgical intervention; insignificant wounds if severely infected might cause fatal results if untreated. Early treatment was most important in the prevention of gas gangrene.

5. Vascular lesions were an important factor when due to injury; as a remedial measure, namely, ligature of great vessels, they were not important; twenty-two cases with vascular lesions were followed by gangrene in six only.

6. Sixty per cent. of gas-infected cases had fractures, and 71 per cent. of those of gas gangrene.

7. Joint injuries occurred in 13 per cent. of gas infections and in 20 per cent. of gas gangrene. They increased the gravity of cases, as damaged joints were difficult to immobilize without pressure.

8. Wounds of the calf, trunk, or hip-joint were specially dangerous.

9. Tissue injury had an important influence. Gas abscesses were frequently seen in gas infections at the site of subcutaneous injections or near simple fractures in the same case.

10. Intramuscular tension from within or without was a potent aid in the production of gangrene.

It was found that the flora of gas gangrene was usually multiple: *B. perfringens* was present in nearly every case, *B. sporogenes* in 41 cases, *Vibrion septique* in 6 cases (several fatal); *B. histolyticus*, *B. Hibler IX*, and *B. oedematiens* were all reported, but less frequently. Streptococci of a virulent type were present in 59 cases, and added to the gravity of the infection. Tetanus occurred in 15 cases, and was demonstrated bacteriologically in 7. Marked and latent forms of tetanus were described. Intrathecal administration of serum, 30 c.cm. at a dose, together with subcutaneous injections up to 30 or 40 c.cm. a day, proved successful. Seven clinical forms of gas gangrene were noted: (1) Classic form (Weinberg); (2) toxic or oedematous type; (3) mixed forms; (4) local gas abscess; (5) superficial and deep-seated gas phlegmon; (6) chronic and latent infections; (7) gas septicaemia or pyaemia.

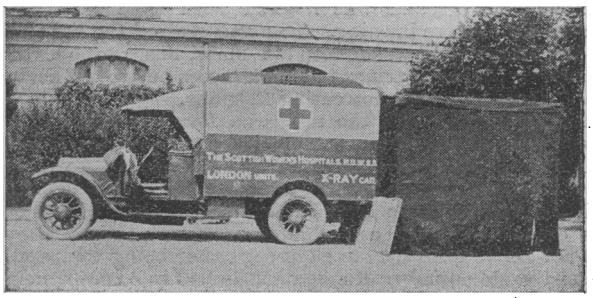

FIG. 3.—X-ray car with tent.

Of 464 cases of gas infection 42 were fatal, 25 dying

from gas gangrene, 4 with tetanus, and the remainder with severe fractures, brain or abdominal injuries.

Amputation was considered necessary in advanced cases of gangrene; it was performed 65 times, with 48 recoveries, by the open method with lateral incisions. When gangrene was limited to groups of muscles or joints, excision was performed—41 times, with 33 recoveries. Hypertonic salt treatment alone was found to be unsuccessful, but combined with 2½ per cent. carbolic acid had given good results. Other methods used, such as continuous irrigation with eusol, Dakin's solution, or normal saline, apparently gave the same results. Ten cases of very severe gas gangrene were treated by antiserums for *B. perfringens*, *B. oedematiens* and *Vibrion septique*. In five cases (one being an instance of septicaemia with triple anaërobic infection) the results were successful. The fatal cases were already septicaemic before serum was given. There was distinct evidence that its curative use might be advantageous and probably its prophylactic use even more valuable.

In the work of the hospital bone injuries were common, over 900 fractures being admitted.

The operations performed included 1,057 for shell and grenade wounds, 264 for bullet wounds, 68 amputations and 59 reamputations, 78 joint operations, 176 for radical cure of hernia, 41 for appendicectomy, and 60 nerve and tendon operations. In addition, 200 civilians from the district were admitted for operative treatment.

When the climate allowed, the sun was found to be a valuable aid in the treatment of wounds, which were exposed, with a thin layer of gauze to keep away flies.

During the two years 3,612 *x*-ray photographs were taken, including a special series showing the presence of gas in the tissues, a subject on which Dr. Agnes Savill made a communication to the Royal Society of Medicine in October, 1916.

Work in Serbia.

The Scottish Women's Hospitals sent out their first unit to Serbia in January, 1915, just after the Austrians had been driven over the Serbian frontier, leaving thousands of sick and wounded. Typhus of a virulent type was raging and the mortality was very high.

The unit went to Kragujevatz, the arsenal of Serbia, where it took charge of 570 beds. The first hospital was prepared in about forty-eight hours. The patients were in a miserable condition, many suffering from septic wounds and bedsores. They were found in all available buildings in the town shivering and verminous. To deal with the large numbers Dr. Eleanor Soltau in a short time opened other buildings with fresh equipment sent from Scotland. At Valjevo 70,000 typhus cases were lying unattended; some were sent at once to Kragujevatz, and Dr. Alice Hutchinson was sent with another unit to open a camp hospital at Valjevo. On its way out the unit stopped for a short time at Malta to nurse British wounded from the Dardanelles. Next Dr. Elsie Inglis arrived in Serbia and opened two additional hospitals, one at Mladanovatz and the other at Lazarovatz. The former hospital was named the Neil Fraser Memorial, after a member of the first unit who had died of typhus. This hospital was under the charge of Dr. Beatrice Macgregor, and was continuously full. The hospital at Lazarovatz, housed in inns and dwelling-houses of the village, was able to accommodate 400 patients.

In an account of some of the medical work done during her ten months in Serbia, Dr. Chesney has reported that 100 out of the 300 officers of the Serbian army medical service died from the fever, and that the Scottish Women's Hospital unit, to which she was attached at Kragujevatz, also suffered severely. Two buildings were taken over at Kragujevatz, so that cases of recurrent fever could be separated from typhus, but in a short time the wards contained nothing but typhus. The windows were kept open, and only one patient was allowed in each bed. The patients were washed, and lice hunted out of every hiding place; but fleas were ineradicable. The bathing arrangements and water heating apparatus were rough but efficient, though fuel was difficult to obtain. The sanitary arrangements were primitive; they consisted of a room with a small hole in a wooden box over a cesspool, and when this was filled up another small room was taken and another cesspool constructed. The cesspools were emptied by suction pumps and carts at intervals. Kragujevatz has normally a population of 10,000, but during the war there were about 20,000, and only five sanitary carts could be allowed for the town. With all its disadvantages the results in the hospital compared favourably with most of those in Skopliji and Banja, where buildings and sanitation were good. Each ward had two English sisters, and a Serbian and two Austrian orderlies. The Austrians made good nurses, and the Serbians preferred their ministrations. They were decent, friendly, and hard working. The sisters maintained discipline with ease by means of a sign language.

Typhus was at its height in February. It was of a very severe type and the death-rate extremely high. Nearly all cases were in the sixth or seventh day of illness when admitted, with the rash well out. Strong patients seemed to suffer most severely; the delirium was more severe, and when this persisted the case was nearly always fatal. The Austrian prisoners often died from heart failure just before the crisis; the majority of deaths were just at the crisis. In the Serbian hospitals the most common complication was gangrene of a moist type, but Dr. Chesney had no such cases, although numb and painful feet occurred not uncommonly. Eleven bullock wagons were sent to the surgical hospital laden with patients suffering from post-typhus gangrene, in an appalling condition from want of nursing. Post-typhus pneumonia was fairly common. The patients responded to good nursing, and the death-rate at this 6th Reserve Hospital was about 16 per cent., which was very low considering the violence of the epidemic.

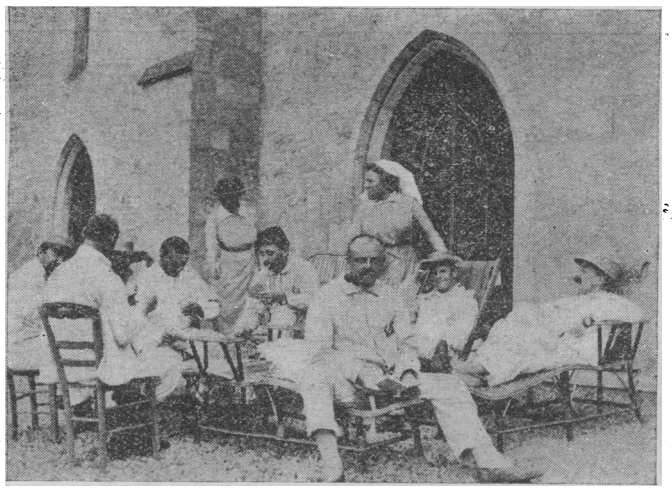

FIG. 4.—Convalescent French soldiers on the terrace.

The precautions against lice taken by the staff were to wear high boots, and to protect the wrist and neck with bandages rubbed with naphthalene. With the advent of summer typhus rapidly died down, the cases became milder, and finally ceased. Recurrent fever followed the same course, and during the summer, except for diphtheria, Serbia was quite healthy.

The Scottish Women's Hospital units worked in Serbia through the summer of 1915 until the advance of the Austro-German army swept them back. First, the Mladanovatz unit, which had treated more than 1,400 cases, had to fall back on Kragujevatz. Next, the Valjevo hospital had to retreat west to Vrnyatochka—Banja, where the members were made prisoners of war and taken to Hungary. The Lazarovatz unit retired to Kurfevatz.

Sir Ralph Paget, British Commissioner, arranged for those who wished to retreat into Montenegro. They endured terrible hardships travelling over snow-capped mountains 7,000 feet high, with food at famine prices, and shelter often not procurable, but with one exception all reached the coast in safety. In Kragujevatz during the first three months of the enemy occupation the care of a large number of Serbian wounded was given over to the Scottish Women's Hospital, and as there was great overcrowding an outbreak of typhus was feared, and an infectious hospital was organized with difficulty, as the Germans would give no other building.

Bathing arrangements were improvised and disinfectors set going. The sanitation was deplorable, and it was necessary to empty the overflowing cesspools, to build incinerators, and to clean incessantly. Thousands of Serbian prisoners taken in the south passed through Kurfevatz miserably underfed. Their sufferings from hunger and exposure were very great. Hospital rations were meagre, and any extra articles, such as milk and eggs, were liable to be seized at the hospital gates by the Austrians. On February 9th the hospital was evacuated. The greater number of patients had been removed to Hungary, and the few remaining, badly wounded, were taken into Austrian hospitals. On February 11th, 1916, the entire hospital staff was sent north under an Austrian guard. In Vienna the Austrian Embassy took charge of them, and they were finally sent home through Zurich.

Work in Salonica.

In May, 1915, the second French hospital under Dr. McIlroy was opened at Troyes. It was established in tents, and at the end of the summer was sent with the French Expeditionary Force to the Balkans. For a month it was stationed at Ghevgeli, and cases were received from the front, which was about fifteen miles away. Orders were then given to evacuate, and the hospital retreated to Salonica, where it opened as a tent hospital on January 1st, 1916, on a stretch of flat ground near the sea, overlooking the bay of Salonica. The medical staff consisted of five women doctors and a radiologist. The climate of Salonica was found very trying, and there was a considerable amount of sickness among the staff during the hot season, when the work was heaviest, 1,000 patients being admitted during July and August with dysentery, malaria, colic, diarrhoea, and jaundice. In October, when active hostilities began again, the hospital was used for wounded. The *x*-ray department treated a considerable number of cases with high frequency, electrical massage, hot air, light and ionization, under the direction of Miss Edith Stoney; cases were sent also from other hospitals for treatment. During the year 3,045 patients were admitted.

FIG. 5.—Scottish Women's Hospital for Serbian refugees in Corsica.

Work in Corsica.

Some of the Scottish women who had been in the Serbian retreat in December, 1915, appalled by the sufferings of the Serbians, undertook, with the approval of the French Government, the provision of medical care for the Serbian refugees in Corsica, and looked after them during their transport from Salonica to Corsica.

Dr. Blair landed in Ajaccio with the first transport full of Serbian refugees on Christmas eve, 1915, and took medical charge of the Serbian colony there. The refugees on the island at one time numbered 6,000. The first Serbs to arrive were from Southern Serbia, some civil officers and their wives and families, some peasants, but all at that time equally destitute, as they had fled before the Bulgarians, leaving everything behind them, and had suffered great privations. The maternity work started before the refugees reached Ajaccio, for a child was born on the first transport. There was a considerable amount of illness among the refugees, the result of exposure, privation, and exhaustion, and there was ever present the possibility of infectious disease. A suitable building was turned into a hospital, which was soon filled with patients, as, in addition to all the serious cases from the refugee colony, numbers of young recruits arrived from Corfu. They had been in the retreat through Montenegro and Albania. The condition of these starving boys was most pitiable, and the most devoted nursing was not always successful in restoring them to health after the privations they had endured. Tuberculosis was extremely common. The most pathetic group of all to arrive were the school boys and students, who from 11 years upwards were marched to the Adriatic lest they should fall into the hands of the enemy; several thousands died by the way, thousands more after reaching the base, so many that the isle where they were quartered came to be known as L'Ile des Morts. The boys who recovered in the hospital were sent first to Great Britain and later to France.

The medical service for the Serbs consists of the main Scottish Women's Hospital at Ajaccio, the branch hospital for isolation (the Lazaret), and out-patient dispensaries at the refugee houses.

During the autumn of 1916 the hospital began to receive discharged incapacitated soldiers. It has over eighty beds occupied and is equipped with a theatre, pathological laboratory, and an *x*-ray installation. There is an open-air department for phthisis, and sun baths are an important part of the treatment. More than 2,000 patients were treated at Ajaccio alone. The Serbs were found to be extraordinarily interesting and grateful patients, and very much endeared themselves to their British nurses.

In the autumn of 1916 the second Serbian army was mobilized and re-equipped at Corfu. The Scottish Women's Hospital received an invitation to send out a unit with it, and Dr. Agnes Bennett went to Salonica in charge of a well equipped hospital of 200 beds. The movements of the unit, which was attached to the Serbian army, were facilitated by the possession of motor transport sufficient not only for the wounded but for the staff. The hospital was first located near Salonica. Later on it was moved to Ostrovo. The bad roads and heavy hill climbing made the transport difficult and dangerous. This hospital received many wounded from the Serbian army during its advance and proved of the greatest value to it. When the army moved forward a small outpost station was sent ahead to enable the most serious cases to be looked after for a few days before being transported over the bad roads. Mrs. Harley, sister of Lord French, who was killed recently in Monastir, was in charge of the transport column.

Work in Russia.

Another unit was sent out through Russia for the 1st Serbian Division of the Russian army in the Dobrudja. It was in charge of Dr. Elsie Inglis and Dr. Lilian Chesney, and started work in October, 1916, at Mejidia, where the barracks were converted into a hospital. About 300 patients were received during the eighteen days of its existence. Owing to the rapid advance of the Bulgars, it had then to be evacuated.

Meanwhile a second hospital had been established at Boulboulmick, consisting of three hospital tents and a dressing tent; after being occupied for a fortnight, it, too, had to retreat to a village near Mejidia. The final retreat was slow and arduous, and great hardships were suffered. The hospital equipment was transported through Cernavode by stages to Ismail and Galatz, and ultimately into Russia, only a motor kitchen and ambulance being lost. Dr. Inglis established dressing stations at Harsova and Braila and found many wounded at the latter place. The unit, when last heard of, was at Bessarabia, across the Russian frontier

Work under the British War Office.

On leaving Paris Dr. Garrett Anderson and part of her staff did good work for some months at Wimereux in association with the R.A.M.C. It was then arranged by the Director-General, Sir Alfred Keogh, that they should organize a military hospital at Endell Street Workhouse Infirmary, London, which they have since conducted with great efficiency. Some results of experience gained there in the treatment of septic wounds have been published by Dr. Garrett Anderson; a first paper, written in conjunction with Miss Chambers, M.D., and Miss Lacey, B.Sc., was specially concerned with the use of salicylic acid. Basing themselves on the study of 1,000 cases they expressed the opinion that salicylic acid applied in a suitable form often saved cases when other methods failed, and was particularly useful when dressings could not be repeated at frequent intervals. They advised that in all cases in which recovery was delayed and the effect of the treatment doubtful it should be controlled by making repeated cultures from the wound surfaces. Drs. Garrett Anderson and Helen Chambers have since reported the results of a careful study of the paste (B.I.P.) recommended by Professor Rutherford Morison, which consists of bismuth subnitrate (1 oz.), iodoform (2 oz.), and paraffin sufficient to make a paste of the consistency of soft butter. The patient is anaesthetized, all gangrenous and necrosed tissue cut away, the wound thoroughly cleansed and swabbed out with rectified spirit, and a small portion of the paste vigorously rubbed into the tissues. As both the constituents are toxic not more than two grams should be used, but subject to this precaution the risk of toxic absorption was found to negligible. A little of the paste is left at the bottom of the wound, which in many cases is closed with interrupted stitches, and dressed with gauze wrung out in spirit. No further dressing is required for seven to fourteen days; this is a great advantage in cases of compound fracture, as is also the fact that drainage tubes are not required. The paste maintains a continuous antiseptic action in the wound. It acts as a lymphagogue, producing a free exudation of serum which washes the wound from within outwards; it does not prevent the escape of discharges; granulation tissue grows freely in contact with it; drainage tubes and gauze drains are unnecessary; septic wounds heal nearly as rapidly as non-infected wounds; and bone union is rapid and the tendency to form sequestra slight.

Of 97 cases of compound fracture, 51.57 per cent. were completely healed within two and a half months of being wounded. Of 62 cases treated to a conclusion, 50 had healed, 4 had sinuses, and 8 superficial wounds. Of the whole series of cases treated, 6 complicated with suppurating joints required amputation after being treated with the paste, but in all extensive infection had occurred before they came under the treatment, and examination of the amputated limb showed that sepsis had subsided in the area to which the paste had been applied, but had spread extensively, so that the paste had not reached the whole of the infected area. Secondary haemorrhage occurred only in one of 400 cases. No case of gas gangrene or tetanus developed under the treatment, although anaërobes were grown from many of the wounds, and from some of them the tetanus bacillus; how much of the favourable results should be attributed to the injection of antitetanic serum, which every patient receives, could not certainly be stated. As compared with the Carrel-Dakin treatment, the object of treatment by B.I.P. is to use a less powerful antiseptic of feeble solubility, which keeps up a continuous action in the depths of the wound without requiring to be renewed for days or even weeks. A bacteriological and chemical examination carried out by Dr. Helen Chambers and J. N. Goldsmith, M.Sc., led to the conclusion that the bactericidal action of B.I.P. is due to the free iodine liberated from the oxidation of iodoform and by the nitric acid formed by the hydrolysis of bismuth subnitrate. The conclusion is that the chief reaction is the continued liberation of small quantities of iodine from a mixture practically insoluble in saline governed by the oxygen supplied from the air or from arterial blood. Cultures taken from open wounds under treatment by B.I.P. showed that they were not bacteriologically sterile, but that there was a reduction in the number of bacteria, which were not able to proliferate freely, and the wounds healed as if surgically clean. Most of the cases under this treatment excreted products of the decomposition of iodoform to a varying extent, and the general effects of iodine absorption may have some bearing on the results.

PHYSICAL TREATMENT OF DISABLED SOLDIERS.

The problem of what should be done for soldiers suffering from results of injuries of joints and nerves and unfit to return to duty or to engage in any industry, but capable of cure or great improvement under suitable treatment, began to press for attention early in the war, and before long became one of great magnitude. At first the men were given extended leave at home, and were treated in out-patient departments or in special centres. One such centre for massage and electricity, promoted by Mr. and Mrs. Almeric Paget in London, was organized by Miss F. Barrie Lambert, M.B., with the help of the Hon. Essex French, daughter of Field-Marshal French. The circumstances under which many of the men were living militated against their recovery, and after inspecting the London centre the Director-General took steps to extend and systematize the treatment. The first great medical convalescent camp was established at Eastbourne, and subsequently command dépôts were added. Dr. Lambert was appointed medical officer in charge of a large mechano-therapeutic department at Eastbourne, where there was an electric installation furnishing galvanic, faradic, and combined currents, a plentiful supply of local radiant heat, and Schnee baths and vibrators. Dr. Lambert insisted on the importance of keeping the apparatus as simple as possible. In an article published last November she said that at the outset, though a fair number of masseuses and teachers of remedial gymnastics were available the supply of electricians was very limited, but that this difficulty had been got over by forming a staff of masseuses in squads, with in charge of each a skilled electrician who was responsible for the work and tuition of the other members. The plan proved satisfactory and was afterwards adopted in convalescent camps at Epsom and Dartford, so that when, some six months later, the command dépôts were started there was a nucleus of experienced and practical electricians to draw upon. The masseuse employed in military work is required to have not less than six months' training, and either to hold the certificate of the Incorporated Society of Trained Masseuses—as 90 per cent. of them do—or to satisfy the board of examiners set up by the War Office. The Eastbourne camp is large; there are 3,000 patients, and the visits to the electrical department vary between 600 and 800 daily. At Dartford camp are 1,200 patients, and from 150 to 200 electrical treatments are given daily. At Epsom, with 4,000 patients, from 500 to 700 are treated daily. Both these camps have been fitted, under the direction of Dr. Lambert, with apparatus similar to that installed at Eastbourne. Later on two other camps were established in the North of England, and there is a similar camp in Ireland, at Randalstown, and one having the same general purpose at Tipperary. It was found that after six months or so in these camps there was a residue of men who, though susceptible to cure, would require a much longer period of treatment—anything from four to six months; for their benefit command dépôts were established. In them convalescent soldiers belonging to particular commands are grouped. The cases are necessarily of a chronic type, and are subject to periodical inspection by medical boards, when men found to be incapable of further military service are discharged and become entitled to a pension. All cases in which it is thought that further improvement may be obtained by surgical interference are examined periodically by the Inspector of Orthopaedics or his representative. The men as they arrive at the command dépôts are drafted into one of five or six groups. In the first group are men who are practically fit but require final hardening by drill, route marching, and so on. In the second group the men receive physical drill, and are encouraged to take part in general sports. In the third group the men have light physical training and work. In the fourth group, consisting mostly of medical cases, the men have light physical training. The fifth group comprises the larger proportion of the cases which require massage, such as stiff joints, trench feet, and nerve injuries. The sixth group comprises cases of shell shock or men so gravely injured that they can only take light exercise and be trained in special movements to improve co-ordination. The average length of time for which a man remains in each dépôt is from two and a half to

three months, by which time he will reach Group I, and after going through the process of hardening will be fit to be transferred to army category A, B, or C.

Dr. Lambert considers that the system of convalescent camps and command dépôts is working very well, that massage is well and intelligently administered, and that the system of training by medical gymnasts is preferable to the use of Zander or other forms of mechanical apparatus.

Finally, it is to be noted that the number of men passed through and restored to health is very large; the number undergoing massage, electricity, and special exercise treatment in the command dépôts at one date in September was 8,262, and the total number of men who had then passed through the dépôts was 127,132.

THE ALLEGED PERILS OF URIC ACID.

BY

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THE public are, through the medium of the daily press, persistently reminded of the perils to which they are exposed from uric acid, but are at the same time confidently promised a safe escape from their dangers by the use of the remedies which the enterprising dealers recommend for that purpose. As all this is merely the usual exploitation of medical opinions which are still unsettled, it is advisable, therefore, to review briefly the alleged facts upon which it is based.

When deposits of uric acid were detected in the joints which had previously been the seats of painful inflammatory swellings, that substance was at once assumed to be the cause of gout; and not only of the typical and so-called regular manifestations of that disease, but also of all functional derangements and anatomical lesions which precede, accompany, and follow that peculiar affection of the joints. This view has gained general and speedy acceptance owing to a favourable concurrence of circumstances. There was the belief, which for centuries has been held—a belief so implicit that from its inception to this day it has never been questioned—that gout is essentially the consequence of excesses in eating and drinking, or of indulgence in particular articles of diet; and as uric acid was supposed to be an imperfect form of urea there was prima facie evidence of its causality. Not the less influential was the disappointment of practitioners who had long since turned away from the wranglings of the humoralists and solidists. Neither the shadowy product of a faulty distillation nor the mysterious influence of the nervous system could satisfy their longing after a clearer insight into the nature of the process with which they had to deal. The remedial measures, which they could plan only upon some speculative opinion, persistently failed. Their failures were disheartening to everybody concerned, and continued to be the subject of general derision as they had been at the time of the Satirists of old. But now there was a prospect of a change for the better. Here was a definite chemical body which as a derivative from food not only confirmed a doctrine held from the remotest antiquity, but encouraged the hope that if its formation could not altogether be avoided its consequences might at least be effectually averted.

Uric acid was thus with one accord admitted as the specific cause of gout; and though recently other substances have been suggested instead of it, it has hitherto lost none of the hold which it had gained at the moment of its discovery as a constituent of tophaceous deposits.

Nothing, however, was known how that peculiar substance obtained and how it exerted its alleged morbific action, for though presumably a toxic agent by virtue of its being an excrementitious substance, it was impossible to overlook the fact that it was invariably formed in the course of normal metabolism, and generally discharged without producing any disturbance. It was obvious therefore that there were here peculiar circumstances which led to its conversion into an irritant and to its deposition into the joints.

The fundamental doctrine supplied the key to the solution of the problem. Excesses in eating and drinking, it was argued, being the primary cause of the disease, it followed that their product would be correspondingly large, and such a mass of effete matter would be enough to account for all the symptoms of gout. Thus the uric acid would contaminate the blood; and if it happened, as it often did, that other acids were generated within or introduced from without, they would render it insoluble. To avert the serious consequences that would ensue from the presence of that impurity the system made efforts to get rid of it, and in favourable circumstances succeeded in doing so by depositing it into the articular cartilages as being parts of no great importance for the preservation of life.

Since this theory was advanced it has been found that uric acid is derived not only from food, but also from the disintegration of the nuclei of the tissues. Whether its origin is endogenous or exogenous, even the largest quantities that may be formed are excreted without any concomitant derangement so long as the renal filter is intact, and whatever the disturbances associated with its imperfect elimination they are not produced by it. All the symptoms that occur in these circumstances are co-ordinate phenomena, and are due to some pathological changes in the kidneys which lead to a retention not only of uric acid but also of urea, of water, and of other effete substances. That such retention is not indifferent to the organism need hardly be insisted upon, but that uric acid is the sole, or even the most potent, element in the causation of the ensuing consequences is a purely gratuitous assumption.

Nothing has been definitely ascertained on this subject, although an over-production of uric acid in gout has been readily assumed. The current view on that point is merely an inference from the fundamental doctrine upon which the pathology of the disease has been constructed. Brugsch, however, holds as the result of his researches that uric acid is formed here in an abnormally small quantity—so small, indeed, that the presumably healthy kidneys are not sufficiently stimulated thereby to effect its removal. He alleges that it is retained in the blood and allowed gradually to accumulate there until it has reached an amount sufficient to break the renal barrier.

Nor is there the slightest evidence of any deficiency of alkalis in the blood, whereby uric acid is rendered insoluble, and thus becomes an impurity of which the organism can only rid itself by depositing it into the joints. Numerous hypotheses have been advanced to account for this supposed conversion, but none of them has been confirmed by actual examination. All inquiries into this subject have shown that there is no deficiency of alkalis, and that uric acid is perfectly soluble even in blood which is saturated with it. The statement of one writer that in his own case he felt, on the consumption of a few drops of an acid, the uric acid immediately rushing into his big toe, stands hitherto as an isolated experience.

Just as there is no foundation for the assumption of the several stages previously referred to which are said to lead ultimately to a deposition of urates, so there is none for the hypothesis that they, in the form of crystals, exert pathogenic influence. Whether they act in the typical attack of gout as mechanical irritants, as some maintain, or as toxic agents, as others hold—in either case it would be necessary that, being the alleged causes, their presence must precede the appearance of their consequences. But though the process takes place in the closed cavity of the joint, and is thus not accessible to direct inspection, yet the conclusion is fully justified that it is not different from what is observable on the surface. Thus Sir Alfred Garrod described the formation of an inflammatory tophus of the ear as starting with a vesicle of clear contents, in which the microscope showed a few uratic crystals. Gradually, when the serum was absorbed, the exudation became inspissated and opaque, the uratic crystals were then more numerous, and when all the fluid was removed the tophus remained. When there is occasion to examine such a tophus anatomically it will be found that there were initial changes either in the subcutaneous tissues or in the cartilage of the ear, or in both.

Not infrequently, however, urates are found on *post-mortem* examination of joints, in which their deposition was never attended by inflammatory or other symptoms, notwithstanding Sir Alfred Garrod's opinion that this cannot take place without producing some twinges. Commonly tophi of very large size are formed on the fingers without the least sign of any inflammatory